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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/644,567
Filing Date: August 20, 2003
Appellant(s): WALTON ET AL.

Joseph T. Grunkemeyer
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed January 23, 2006 appealing from the Office action mailed May 27, 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,146,635	Cano et al.	11-2000
4,336,277	Bunshah et al.	6-1982

3,436,332	Oda et al.	4-1969
3,393,142	Moseson	7-1968

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-3, 7-9 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meger et a. "Beam-generated plasmas for processing applications", Physics of plasmas, Volume 8, Number 5 May 2001, pp. 2558-2564 in view of Moseson (U.S. Pat. 3,393,142).

Regarding claim 1, Meger et al. teach a plasma system. (See Abstract) The plasma system has an electron beam source that has a width much larger than its thickness. i.e. A thin (about 2 cm) sheet plasma with a large area (i.e. width). (See Page 2563) The average electron energy is from 1-5 KeV. (See Abstract) A gas is provided such as argon, nitrogen, or oxygen. A pair of Helmholtz field coils confines the beam. (Page 2559) The temperature of the plasma can be 1 eV. (See Abstract) As to the "capability" of the apparatus working in 10 mTorr of oxygen since the electron beam is produced in the same apparatus with the same characteristics as required by Applicant's electron beam it is believed the that electron beam source apparatus is "capable" of operating at 10 mTorr of oxygen.

Regarding claim 8, the electron beam source is a linear hollow cathode beam source. (See Fig. 1B)

Regarding claim 9, argon, nitrogen or oxygen can be used. (See page 2559)

Regarding claim 15, the plasma sheet can be 60 x 60 cm^2. (See Abstract)

The difference between Merger et al. and the present claims is that the use of a sputtering target is not discussed (Claims 1, 2), locating a substrate for deposition on is not discussed (Claims 3), the source being select from metals, alloys, semiconductors, or non-conducting materials (claim 7).

With regard to Applicant's claim 1, Moseson teach an apparatus for establishing an ion plasma adjacent an ion target for sputtering of the ion target to form films on a substrate. (Column 1 lines 60-64) With regard to Applicant's claim 1 and considering Figure 4 of Moseson, the apparatus can comprise an electron beam source comprised of a filament 41 guided by a tubular member 32 into the interior of an adaptor 184, which rests on the plate 50. The adaptor 184 has a nozzle 185, which extends in the direction of an anode 181. The tubular member 32 and the adaptor 184 jointly operate to provide a stream of electrons, which issues through the nozzle 185 in a direction substantially parallel to the plate 50. (Column 6 lines 36-43) The configurations of the adaptor 184 and the nozzle 185 are best apparent from Fig. 5 of the drawings. From this figure it will be recognized that the nozzle 185 defines a rectangular aperture 187, which is similar to the previously described aperture 155 shown in Fig. 3. Dotted lines in Fig. 5 indicate the configuration on anode 181. This anode configuration corresponds to the configuration of the aperture 87, so that an approximately prismatic ion plasma will be formed between the nozzle 185 and the anode 181 in the absence of a magnetic field. Dotted lines 188 in Fig. 4 are intended to outline this ion sheet. (Column 6 lines 44-55) The apparatus shown in Figs. 4 and 5 has the advantage that the ion plasma sheet is in a horizontal plane. (Column 6 lines 72-74) From Fig. 5 the width of the

electrons beam is much large than it's thickness. (See Fig. 5) Considering Figure 4 of Moseson, the plasma sheet exists in the horizontal plane (Column 6 lines 72-74) produced form the electrons and has a width, thickness and length as seen and suggested in Figs. 4 and 5. (See Figures 4 and 5) Considering Figure 4 of Moseson, an electromagnetic coil 193 is positioned to establish parallel field lines and control the plasma and thus the sputtered film density on the substrate. The coil 193 may be movable (Column 6 lines 69-71) in order to effect the uniformity of film thickness on the substrate surface. (Column 4 lines 65-68) The plasma is in a horizontally sheet. (Column 6 lines 72-73) Considering Fig. 4 of Moseson, an ion target 95 is present for depositing a film of coatings on substrates. (Column 6 lines 56-62) Considering Fig. 4 of Moseson, a substrate 190 is present for deposition upon. (Column 6 lines 59-62)

With regards to Applicant's claim 2, the target 95 is connected to battery 102 in order to provide the bias in order to attract ions out of the plasma sheet for sputtering. (Column 6 lines 18-35; Column 6 lines 56-62)

With regards to Applicant's claim 3, the electrical bias is DC bias as shown schematically in Fig. 4. (See Figure 4)

With regards to Applicant's claim 7, the Moseson recognize that metallic elements and many alloys have been sputtered in the prior art (Column 1 lines 24-27) and their invention provides an apparatus for depositing those thin film materials. (Column 1 lines 53-56) A target is used for depositing the films. (Column 6 lines 56-62)

The motivation for utilizing a sputtering target, locating a substrate for deposition and selecting from metals, alloys, semiconductors, or non-conducting materials for

deposition in an electron beam apparatus is that it allows for reducing the energy requirements of sputtering operations. (Column 1 lines 50-53)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Meger et al. by utilizing a sputtering target, locating a substrate for deposition and selecting from metals, alloys, semiconductors, or non-conducting materials for deposition as taught by Moseson because it allows for reducing the energy requirement for sputtering operations.

Claims 4, 5, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meger et al. in view of Moseson as applied to claims 1-3, 7-9 and 15 above, and further in view of Oda et al. (U.S. Pat. 3,436,332).

The differences not yet discussed are the substrate being electrically biased is not discussed (claim 4), the electrical bias being DC or RF is not discussed (claim 5) and where the target and the substrate are biased (claim 10).

Oda et al. teach biasing the substrate. The substrate can be biased by a DC electric source or an AC electric source. (Column 3 lines 11-18) Oda et al. further suggest that the target be sputtered by applying a bias voltage as well. (Column 2lines 70-72; Column 3 lines 1-5)

The motivation for biasing the substrate and utilizing DC or RF sources to bias the substrate is that it prevents electrons from entering the electron guide tube 16. (Column 3 lines 15-18)

The motivation for biasing both the substrate and the target is that it allows for deposition of films. (Column 3 line 5)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have biased the substrate, utilized DC or RF sources to bias the substrate and to have biased both the substrate and the target as taught by Oda et al. because it allows for preventing electrons form entering the electron guide tube and for depositing films.

Claims 6 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meger et al. in view of Moseson as applied to claims 1-3, 7-9 and 15 above, and further in view of Hurwitt et al. (U.S. Pat. 6,416,635).

The differences not yet discussed is the target and the substrate being adjustable is not discussed (claim 6) and a sputtering magnetron being utilized is not discussed (Claim 12).

With regard to Applicant's claim 6, Hurwitt et al. teach that either the target or the substrate can be moved relatively to one another. (Column 5 lines 47-53) Also, Moseson suggest adjusting the beam position by moving the magnet field. (See Moseson discussed above)

The motivation for moving the target and the substrate relative to one another is that it allows for improving uniformity. (Column 6 lines 3-8)

With regard to Applicant's claim 12, Hurwitt et al. teach that a magnet assembly can be utilized behind the target for confining and enhancing the plasma during sputtering. (Column 6 lines 56-59)

The motivation for utilizing a magnetron is that it allows for confining and enhancing the plasma during sputtering. (Column 6 lines 56-59)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have moved the substrate and target relative to one another and to have utilized a magnetron for confining and enhancing the plasma during sputtering as taught by Hurwitt et al. because it allows for forming uniform films and for confining and enhancing the plasma during sputtering.

Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meger et al. in view of Moseson as applied to claims 1-3, 7-9 and 15 above, and further in view of Bunshah et al. (U.S. Pat. 4,336,277).

The differences not yet discussed are utilizing a vaporization means is not discussed (claim 13) and positioning the electron beam produced plasma between the source material and the substrate is not discussed (claim 14).

With regard to claims 13 and 14, Bunshah et al. suggest placing a vaporization means in a chamber opposite substrates with an electron beam means positioned between the vaporization means and the substrates. (See Figure; Column 3 lines 25-27; Column 56-68)

The motivation for utilizing a vaporization means and locating the electron beam between the source and the substrate is that it allows for producing high quality coatings. (Column 1 lines 35-36)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized a vaporization means and positioned the electron beam produced plasma between the source material and the substrate as taught by Bunshah et al. because it allows for producing high quality coatings.

(10) Response to Argument

A. Response to the arguments for claims 1-3, 7-9 and 15 rejected as obvious over Meger et al. in view of Moseson.

In response to the argument that there is no motivation for combining Moseson with Meger et al. because Moseson teaches the desirability of reducing the energy requirements of sputtering operations while Meger et al. shows utilizing increased energy for operation, it is argued that there is motivation to combine because Moseson establish that a sputtering target or source is utilizable in an apparatus where an electron beam is used to generate a plasma for performing a sputtering process and will produce quality films. Furthermore, Meger et al. teach an electron beam for generating the plasma and suggest utilizing the ***"plasma for processing applications"***. Therefore when considering the teachings of Moseson in which a sputtering ***"process"*** is performed it would be obvious to one of ordinary skill in the art to modify Meger et al. by placing a sputtering target in Meger et al.'s apparatus since ***"processing"*** is what is required to take place in their apparatus. (See Meger et al. and Moseson discussed above)

In response to the argument that the phrase ***"plasma for processing applications"*** in Meger would not suggest sputtering and is merely speculative, it is argued as discussed above that sputtering can be considered to be a plasma ***"process"*** and thus is suggestive of a ***"plasma processing applications"***. This evidenced by the teachings of Moseson which show the sputtering plasma process application. Furthermore, the phrase ***"plasma for processing applications"*** is

construable to include sputtering and other methods (i.e. etching) and is a term of art construed to include numerous processing embodiments. Further evidence that ***"plasma for processing applications"*** is a term of art is readily available in Handbooks such as "Handbook of Deposition Technologies for Films and Coatings" from Noyes Publications which mentions that ***"processing plasma is a plasma that is used in materials processing"*** and that such ***"plasmas for processing"*** are used in sputtering. (See Moseson and Meger et al. discussed above) (Note that excerpts from the "Handbook of Deposition Technologies for Films and Coatings" is attached for convenience.)

B. Response to the arguments for claims 4, 5, 10 rejected as obvious over Meger et al. in view of Moseson and further in view of Oda et al.

In response to the argument that Oda et al. does not suggest biasing the substrate, it is argued that Oda et al. at Column 3 lines 11-14 suggest electrically biasing the substrate where it states that "it is possible to employ a positive or negative DC electric source or an AC electric source as the substrate bias electric power supply 56". (See Oda et al. discussed above)

C. Response to the arguments for claims 6 and 12 rejected as obvious over Meger et al. in view of Moseson and further in view of Hurwitt et al.

Appellant has argued that there is no motivation to combine Meger and Moseson to rebut the rejection of claims 6 and 12. This argument has previously been addressed by the Examiner above and this response applies here as well.

D. Response to the arguments for claims 13 and 14 as obvious over Meger in view of Moseson and further in view of Bunshah.

Appellant has argued that there is no motivation to combine Meger and Moseson to rebut the rejection of claims 13and 14. This argument has previously been addressed by the Examiner above and this response applies here as well.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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